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Tamara Ketabgian, *The Lives of Machines: The Industrial Imaginary in Victorian Literature and Culture*. Ann Arbor: University of Michigan Press, 2011. 252 pp. ISBN 0472051407.

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There are few more pervasive metaphors in our conceptualizations of the human than the industrial imaginary explored by Tamara Ketabgian in *The Lives of Machines*. The “fuel” of food saves us from “running out of steam” or becoming “broken” components within an “overheated” economy; these metaphors are akin to Ketabgian’s example from Charlotte Brontë’s *Shirley* (1849) in which Robert Moore exclaims that “the machinery of all my nature, the whole engineering of this human mill, the boiler which I take to be the heart, is fit to burst” (1). What makes Ketabgian’s approach innovative, though, is that it moves beyond the trope of the body as machine, to mine further nuances of industrial metaphor and technology that are, as she suggests, “rooted in complex models of affect, community, intelligence, energy and life itself” (2). Her focus is on the writings of such leading mid-century authors as George Eliot, Charles Dickens, and Elizabeth Gaskell, which she relates in thought-provoking ways to the wider literary and publication contexts of British culture from the 1830s to the 1870s. Ketabgian’s innovative and perceptive approach saw the book shortlisted for the British Society for Literature and Science annual book prize in 2012, and she opens up the true range of conceptual relationships between machines, culture and humanness. In doing so, she reveals the many unique and metaphorically suggestive insights their interaction offers for our understandings of what it is to be human.

Ketabgian’s compelling new approach to nineteenth-century machines and technology proposes that machines “had a rich figurative life, yielding a broad literary array of habits, feelings, communities, and subjectivities” (2). What this seeks to overturn is the more commonplace contention that Victorian machines are “simply soulless, lifeless, predictable, and unidimensional; not simply opposed to organic feeling and vitality; and not simply reductive material objects--if objects are ever so” (2), represented by studies such as Nichols Fox’s excellent monograph *Against the Machine: The Hidden Luddite Tradition in Literature, Art, and Individual Lives* (Washington, D.C.: Island Press, 2002). Ketabgian’s proposition contributes, instead, to the current resurgence of interest in the machine’s role in nineteenth-century material cultures. Herbert Sussmans’s *Victorian Technology: Invention, Innovation, and the Rise of the Machine* (Santa Barbara, CA: Praeger, 2009) investigates, for example, how the energy and inventiveness of nineteenth-century industrial cultures provided the foundation for subsequent material and consumer cultures, while Deirdre Coleman and Hilary Fraser’s essay collection *Minds, Bodies, Machines, 1770-1930* (Houndmills, Basingstoke, Hampshire, UK; New York: Palgrave Macmillan, 2011) explores how technology impacted conceptions of language, consciousness, human cognition, and boundaries between materialist and esoteric sciences, during the nineteenth-century “age of machinery.” Ketabgian seeks to offer “a more inclusive history of technoculture” (3), in which humans became part of machinery rather than being just extended or contained by it, and where body parts and machines are endowed with agency. While her approach might seem to relate directly to Bill Brown’s “thing theory,” as much as to Heideggerian philosophical distinctions about nature, her ability to resist getting bogged down in either demonstrates elegance and scholarly maturity. Her observations are also particularly important just now, when scholarly focus on the body in nineteenth-century literature is

becoming increasingly worn, and critical interest continues to grow in literary engagements between nineteenth-century industrial, machine and material cultures.

Ketabgian reminds us of the extent to which the “tale of degraded mechanical feeling” relies on accounts of the “deadening effects of technology” from Matthew Arnold and John Ruskin, as leading members of an overly dominant “Victorian anti-industrial elite” (8). Ketabgian steers clear of discussing Romantic stances towards industry, perhaps because the contributions they make to this one-sided narrative might seem almost too obvious. It is worth noting here, though, the doom-laden oppositions between humans and machines popularized by William Blake and Lord Byron, as much as by William Wordsworth and Johann Wolfgang Goethe, which supplanted seventeenth-century ideas of mechanical vibrancy from René Descartes’s machine-body in *Traité de l’homme* (written in the early 1630s, and published posthumously in 1662), to Thomas Hobbes’s proposition in *Leviathan* (1651) that the self-sustaining movement of engines and clockwork mechanisms might represent alternative forms of artificial life. Ketabgian notes, instead, the negativity towards the industrial, mechanical and technological that spreads from the nineteenth century into twentieth-century accounts of culture by F. R. Leavis and Raymond Williams, as well as New Historicist criticism. She observes that “after all, so many of our popular accounts of Victorian alienation are Modernist formulations” (9), a comment that may prompt us to read in a new light the “Modernist” flavor of Victorian ambivalence towards industry and machine technologies, evident in works such as Thomas Carlyle’s “Signs of the Times” (1829) or William Morris’s *News from Nowhere* (1890). Beyond this, though, Ketabgian asserts boldly that “to redefine the machine more flexibly we must also reassess the literature of the machine, questioning established critical categories that have obscured its scope and complexity” (4), and her rigorous and innovative research more than bears out this central contention, making the book highly persuasive, accessible and engaging.

The Lives of Machines is structured in three parts, under “Prosthesis,” “Animal Machine” and “Energy System.” In her first chapter, Ketabgian recalls Samuel Butler’s question of whether the Victorian worker was a “prosthetic attachment” to the machine or, in fact, the machine was a prosthetic organ of the human body (17). She uses this as a launching point for her examination of the hybrid machine-human, the fragmentation of the body into appendages and parts, and “the notion of a full complete body” (18) that was destabilized by such authors as Charles Babbage, Butler, Harriet Martineau and Karl Marx. Ketabgian explains, for example, how the dominance of machinery, manufacture and factories in Marx’s *Capital* contributed to “a radically altered and foreshortened notion of the human” (20) and how Scottish scholar and chemist Andrew Ure valorizes the “vast automaton” of the nineteenth-century factory in *The Philosophy of Manufactures* (1835), and how it absorbs and transforms workers with its scale and rhythms of “unvarying regularity” (22). Ketabgian notes how the machinery of the textile factories “literally dwarfs its female workers” so that they become a “sparse dotting of heads” and “humans and machines become literally interchangeable” (22). Set against the vast new industrial machines and the further extended backdrops newly revealed by Victorian geological and evolutionary theories, human life must have seemed even more impossibly tiny, fragile and vulnerable. Ketabgian’s study illustrates the shifts of perspective that took place as a result of Victorian technological developments. The anxieties they induced also seem strikingly similar to today’s concerns about human entanglements with the seemingly infinite and ubiquitous worldwide “web.”

Ketabgian's investigation into Dickens's oft-cited characterization of factory machines as "melancholy mad elephants" in *Hard Times* (1854) is especially thorough. She sets out succinctly the mechanistic seventeenth- and eighteenth-century philosophies that created common conceptions of the "animal machine" (50), before she goes on to demonstrate how nineteenth-century engines emerged as distinctly motorized, "virile and energetic" (51). Rather than focusing on the gendered and reproductive nuances of this phrase, she shows how factories and machines were increasingly credited with vitality, animality and agency, not least because nineteenth-century industrial contexts brought workers into such relentlessly and physically close proximity to machines. Particularly rewarding is Ketabgian's reading of the circus manager Mr. Sleary's lisping account of a murderously violent elephant, in terms of colonial fantasies of "Asiatic despotism" (58) and the propensity of machines to switch suddenly from servility to revolt. One of the reasons why Ketabgian's research is so convincing and interesting is her deft referencing and alignment of diverse sources. In this chapter, alongside Dickens's novel, she quotes in quick succession from an article in *Household Words* and *Sketches by Boz*, a lecture by Michael Faraday, and the labor-movement periodical, the *British Labourer's Protector* (1832), to name but a few. The range of genres Ketabgian employs to illustrate her thesis is adventurous yet always relevant, strikingly highlighting just how integrated these processes were within the period's publication, scientific and political cultures. Ketabgian's discussion might have been enhanced here by the inclusion of more illustrations from popular journals and newspapers, like *The Illustrated London News*, which also influenced nineteenth-century readers' perceptions and shaped how they visualized the nature of machines.

"Brute appetites" are also the focus of Ketabgian's study of Elizabeth Gaskell's *Mary Barton* (1848). While Victorian machine cultures have long been presented as alienating and dehumanizing, Ketabgian proposes that fictions and metaphors about them also convey "intense and specifically industrial forms of affect, appetite and ritual" (72). Workers' appetites are represented, she suggests, as excessive, bestial and irrational, particularly the emotional cravings for food portrayed in Gaskell's intriguing short story, "Libbie Marsh's Three Eras" (1847). Ketabgian reaches beyond the already familiar rhetorical objections to Victorian industrialization to reveal how it was questioned by means of statistical documentation in non-fiction. She reproduces, for example, a table published in *Artisans and Machinery* (1836) by Peter Gaskell, Elizabeth Gaskell's distant cousin, which charts correlations between increases in machine productivity and vices such as drunkenness, debauchery, crime and poverty (78), between 1821 and 1832. It is fascinating to see an early example of the type of statistical survey that was more frequently undertaken and published by such social critics as Henry Mayhew in the late 1840s and early 1850s. Ketabgian describes how connected the lives and occupations of Victorian workers were perceived to be, through further interesting conceptualizations by Victorian critics including William Cooke Taylor and Friedrich Engels. As Ketabgian indicates, they describe "a recurring circuit of industrial stimulation and resulting fatigue" (82), in which "associated with a deficit of energy outside of the factory, mechanized labor is a shadowy presence behind working-class efforts to find other recreational sources of excitement" (83). The energies of humans and machines are conflated in a single, complex, cultural system, the discussion of which might have been just as appropriate in the book's subsequent and final section "Energy System."

Ketabgian's penultimate chapter attempts to recognize how contentious and speculative theories about the physical world continued to be, despite the establishment of certain facts. Throughout the nineteenth century considerable space was created for uncertainty, contradiction and speculation, resulting in what Martin Willis describes as a confusing "heterogeneity" (71) of early competing electrical theories (*Mesmerists, Monsters, and Machines* [Kent, Ohio: Kent State University Press, 2006]). Ketabgian discusses the "industrializing [of] human sensation and perception" (107), particularly in relation to Victorian water and steam power in George Eliot's *Mill on the Floss* (1860), and she suggests that the steam engine was often visualized both as a natural energy system and as a diffuse metaphorical principle "in other period texts" and "popular mid-century portraits." Examples of these and the particular names of the "mid-Victorian physicists and physiologists" (110) she mentions might make this assertion more rigorously, as later when she mentions Faraday, W. R. Grove and Hermann von Helmholtz. Ketabgian suggests that these three pioneers promoted an "expansive view of force" (120). She quotes Faraday's claim that "force can neither be created nor destroyed" (120), from his essay "On the Conservation of Force," which was published in *Experimental Researches* (1859).

There is a danger, in this chapter entitled "Psychic Forces," that contemporary investigations and interpretations of physical "force" might be misconstrued. While it is certainly the case that "psychic" powers were open to investigation, it needs to be clarified that, with very few exceptions, they were not generally the focus of investigation by mainstream physical sciences. A degree of overlap existed between them, in the work of the Society for Psychical Research, founded in 1882; on the whole, however, they operated within different spheres and according to different empirical standards. Ketabgian's reference to the "psychic" could seem to suggest otherwise, since the term tends to imply essentially indefinable forces. Although conceptions of physical "forces" and "energy" certainly resisted definition in the mid-nineteenth century, considerable headway had been made in measuring their properties, and their constituent parts and behavior could be demonstrated and predicted according to specific laws of thermodynamics.

The anxieties that surrounded early theorizing about "unseen" forces in the physical universe should also be noted, to offset any misguided impression that the hard-won facts of nineteenth-century science might also have been matters of certainty. Ketabgian observes, for example, that Faraday's theory of "conserved" force was *not* the same as earlier claims for "convertible" force; that, even when force appears to be dissipated, it is actually converted to other forms, such as heat, magnetism, chemical action, or motion. In his original 1857 paper, Faraday may have appeared to promote an "expansive" view of force, but he also added an addendum in 1859, in which he sought to define more clearly what he really meant by the term "force," fearing that his earlier argument may have been found "very obscure" and "not stated the matter with sufficient precision." His wish to clarify illustrates what was the simultaneous speculative yet "scientific" nature of nineteenth-century explorations.

The interaction between machinery and nineteenth-century energy sciences provides a valuable backdrop for Ketabgian's reading of Eliot's *The Mill on the Floss* as a "natural-force machine" (138). She reads "The Great Rescue" persuasively as a depiction of "mechanical restraint and diffusion," with Tom's stance in the mill waters and his castigation of Maggie's "formless drifting" operating as "Smilesian and Carlylean images of heroically canalized waterpower." The

reference to psychic forces is more relevant here, in relation to fiction, particularly in Ketabgian's elegant assertion that "although Tom argues otherwise, 'conquering' psychic force is impossible in *The Mill on the Floss*. Like other forms of energy, it may be channelled or converted, but not destroyed." She observes insightfully the resonance between water and steam displayed throughout the novel, "as powers fuelling a cycle of narrowness and expansion" (143) in terms of setting and characters, history and community. Importantly, she also points out the notable caveat that, despite the "prominent cultural sway of the 'unity' of force," Eliot's narrative incorporates an equally significant lack of resolution and uncertainty. It is particularly rewarding that Ketabgian tells us of how Eliot "owned, annotated, and likely consulted" (139) somewhat obscure books such as T. D. Lauder's *Great Floods of August, 1829, in the Province of Moray* (1830), and that she includes a passage marked in Eliot's hand about the network of courses being constructed across the country, to channel water from bogs, rivers and rain. These inclusions contribute very usefully to our understanding of the embeddedness of fiction and how, in the process of writing, authors like Eliot often drew directly upon contemporary non-fiction and interdisciplinary sources.

All work and no play makes Jack a dull boy, and Ketabgian's final chapter takes this into account by focusing on that icon of Victorian bourgeois leisure, the piano. Recalling the piano's popular contemporary moniker as a "musical steam machine," she explores depictions of musical performance and virtuosity in George Eliot's *Daniel Deronda* (1876) and in the lesser-known popular novel *Marianne Withers* (1851) by Geraldine Jewsbury, alongside contemporary essays and sketches of the piano virtuosi Franz Liszt and Anton Rubenstein. This final chapter adds a valuable degree of interdisciplinarity to Ketabgian's study, making it an even more worthwhile resource for researchers of literary and cultural contexts. She suggests herself that the book urges us to "rethink the aesthetic aims, effects and experiences for which we read period texts," in "posing an alternate industrial model of character" (167). This aim differs substantially from Ivan Raykoff's recent study of "Piano, Telegraph, Typewriter: Listening to the Language of Touch," published in *Media, Technology, and Literature in the Nineteenth Century: Image, Sound, Touch*, ed. Colette Colligan and Margaret Linley (Ashgate, 2011). Both studies discuss the Viennese pianist, composer and teacher Carl Czerny. Ketabgian suggests that George Eliot shared Czerny's teaching philosophy that "mechanical discipline supports the pursuit of artistic mastery" (158), although of course innate talent is also emphasized by Klesmer in *Daniel Deronda* as the truly essential requirement for musicians. Ketabgian makes the point that Eliot's and Jewsbury's novels extol "industrial regularity as a standard of conduct as useful as it is beautiful" (158), a perceptive observation that might also be applied more widely.

Ketabgian's study of interactions between humans and machines goes beyond over-simplified or figurative notions of personification, metaphor and anthropomorphism, to explore the question that she phrases as "what might it mean to feel like a machine?" (163). The invention and introduction of machines to everyday and working life meant Victorians were confronted with entities capable of moving, making sound and existing, almost independently of human agency. Ketabgian's book reveals both the hopes and the anxieties this provoked, during a period when the possibilities for control--of the self, of objects, and of the inherent interactivity between the two--seemed constantly shifting and elusive, as well as newly available and exciting.